

Amendment to the Claims:

Before claim 1, please delete the word "Claims" and substitute the following:

What is claimed is:

1. (Currently Amended) A method for detecting an abnormality of a heat exchanger ~~[(3, 5)]~~ exchanging heat between a first fluid flow ~~[(7)]~~ flowing in a conduit ~~[(6)]~~ and a second fluid flow ~~[(8)]~~ flowing along a flow path ~~[(9)]~~, said conduit ~~[(6)]~~ and said flow path ~~[(9)]~~ each having an inlet and an outlet, said method ~~[[c h a r - a c t e r i z e d i n]]~~ comprising the steps of:

establishing at least one parameter representative of the temperature conditions of the heat exchanger ~~[(3, 5),]~~;

establishing a second fluid inlet temperature~~[[,]]~~;

establishing a parameter indicative of expected heat exchange between the heat exchanger and the second fluid~~[[,]]~~;

~~processing the heat exchanger temperature, the second fluid temperature and the parameter indicative of expected heat exchange for establishing an estimated second fluid outlet temperature[[,]]; and~~

employing the estimated second fluid outlet temperature for evaluating the heat exchange between the first and second fluids by comparing the estimated second fluid outlet temperature, or a parameter derived therefrom, with a reference value~~[[,]]~~;

wherein the estimated second fluid outlet temperature is established from at least one parameter representative of the temperature conditions of the head exchanger, the second fluid inlet temperature and the parameter being indicative of an expected heat exchange.

2. (Currently Amended) ~~[[A]]~~ The method according to claim 1, ~~[[c h a r a c t e r - i z e d i n]]~~ wherein the reference value is a predetermined second fluid outlet temperature.

3. (Currently Amended) ~~[[A]]~~ The method according to claim 1, ~~[[c h a r a c t e r - i z e d i n]]~~ wherein ~~[[using]]~~ the estimated second fluid outlet temperature is used for establishing a second heat rate of the second fluid for evaluating the energy balance of the second heat rate of the second fluid compared to a first heat rate of the first fluid.

4. (Currently Amended) ~~[[A]]~~ The method according to claim 3, ~~[[c h a r a c t e r - i z e d i n]]~~ wherein ~~[[establishing]]~~ the second rate of heat flow of the second fluid

is established by establishing an estimate of a second fluid mass flow and a specific enthalpy change of the second fluid across the heat exchanger based on the estimated second fluid outlet temperature and the second fluid inlet temperature, and the condensation pressure.

5. (Currently Amended) [[A]] The method according to claim 3 [[or 4]], [[c h a r a c - t e r i z e d in]] wherein [[establishing]] the first rate of heat flow is established by establishing a first fluid mass flow and a specific enthalpy change of the first fluid across the heat exchanger based on parameters representative for first fluid inlet and outlet temperatures.

6. (Currently Amended) [[A]] The method according to [[any of the claims 3-5, c h a r a c t e r i z e d in]] claim 3, wherein [[establishing]] a residual is established as difference between the first heat rate and the second heat rate.

7. (Currently Amended) [[A]] The method according to claim 2, [[c h a r a c t e r - i z e d in]] wherein [[establishing]] a residual is established as difference between the estimated and predetermined second fluid outlet temperature.

8. (Currently Amended) [[A]] The method according to claim 6 [[or 7]], [[c h a r a c - t e r i z e d in]] wherein [[providing]] an abnormality indicator is provided by means of the residual, the abnormality indicator being provided according to the formula:

$$S_{\mu,i} = \begin{cases} S_{\mu,i-1} + s_i, & \text{when } S_{\mu,i-1} + s_{\mu,i} > 0 \\ 0, & \text{when } S_{\mu,i-1} + s_{\mu,i} \leq 0 \end{cases} \quad (20)$$

where $s_{\mu,i}$ is calculated according to the following equation:

$$s_{\mu,i} = c_1 \left(r_i - \frac{\mu_0 + \mu}{2} \right) \quad (21)$$

where

r_i : residual

c_1 : proportionality constant

μ_0 : first sensibility value

μ : second sensibility value.

9. (Currently Amended) A heat exchanger abnormality detection device for a heat exchanger [(3, 5)] exchanging heat between a first fluid [(7)] in a conduit [(6)] and a second fluid [(8)] in a flow path [(9), c h a r a c t e r i z e d in that]] the device [[comprises]]comprising:

_____a first estimator estimating at least one parameter representative of the temperature conditions of the [[a]] heat exchanger [[temperature,]];

_____a first intermediate memory means storing at least one parameter representative of the temperature conditions of the heat exchanger [[temperature,]];

_____a temperature sensor measuring the second fluid inlet temperature[[,]];

_____a second intermediate memory means storing the second fluid inlet temperature, a second estimator establishing a parameter indicative of expected heat exchange between the heat exchanger [[(3, 5)]] and the second fluid [[(8),]];

_____a third intermediate memory means storing the parameter indicative of expected heat exchange[[,]];

_____a processor establishing an estimated second fluid outlet temperature; ~~based on said heat exchanger temperature, said second fluid inlet temperature, from the first and second intermediate memory means, respectively, and, from the third intermediate memory means, the parameter indicative of expected heat exchange,~~ and

_____a comparator comparing the estimated second fluid outlet temperature, or a parameter established on basis thereof, with a reference value[[,]];

wherein the estimated second fluid outlet temperature is based on said at least one parameter representative of the temperature conditions of the heat exchanger, said second fluid inlet temperature, from the first and second intermediate memory means, respectively, and the parameter indicative of expected heat exchange from the third intermediate memory means.

10. (Currently Amended) [[A]] The detection device according to claim 9, ~~[[c h a r - a c t e r i z e d in that]]~~ wherein the detection device further comprises memory means for storing at least one parameter from the processor.

11. (Currently Amended) [[A]] The detection device according to claim 9 ~~[[or 10]],~~ ~~[[c h a r a c t e r i z e d in that]]~~ wherein the heat exchanger [[(3, 5)]] is part of a vapour-compression refrigeration or heat pump system [[(1)]] comprising a compressor [[(2)]], a condenser [[(3)]], an expansion device [[(4)]], and an evaporator [[(5)]] interconnected by conduits [[(6)]] providing a flow circuit for the first fluid [[(7)],], said first fluid [[(7)]] being a refrigerant.

12. (Currently Amended) [[A]] The detection device according to claim 11, ~~[[c h a r a c t e r i z e d in that]]~~ wherein the heat exchanger [[(3, 5)]] is the condenser [[(3)]].

13. (Currently Amended) [[A]] The detection device according to ~~[[any of the claims 9-12, c h a r a c t e r i z e d in that]]~~ claim 9, wherein the second fluid [[(8)]] is air.

14. (Currently Amended) [[A]] The detection device according to [[any of the claims 11-13, characterized in]] claim 11, wherein that the condenser [[(3)]] is part of a refrigerated display cabinet positioned within a building and the condenser [[(3)]] is positioned outside the building.

15. (Currently Amended) [[Use of a]] The detection device according to [[any of the claims 9-14, characterized in that]] claim 9, wherein the detection device is used for detecting fouling of the heat exchanger [[(3, 5)]] and/or detecting insufficient flow of the second fluid [[(9)]].